

# Table of Contents

---

|   |           |
|---|-----------|
| Credits and Acknowledgements .....                                    | iii       |
| Executive Summary .....   | 1         |
| <b>Chapter 1. General Introduction .....</b>                          | <b>5</b>  |
| <i>Introduction</i> .....   | 5         |
| <i>Background</i> .....   | 5         |
| <i>Receiving Waters Monitoring</i> .....                              | 6         |
| <i>Literature Cited</i> .....   | 7         |
| <b>Chapter 2. Oceanographic Conditions .....</b>                      | <b>11</b> |
| <i>Introduction</i> .....   | 11        |
| <i>Materials and Methods</i> .....                                    | 12        |
| <i>Results and Discussion</i> .....                                   | 13        |
| <i>Summary and Conclusions</i> .....                                  | 21        |
| <i>Literature Cited</i> .....   | 21        |
| <b>Chapter 3. Water Quality .....</b>                                 | <b>25</b> |
| <i>Introduction</i> .....   | 25        |
| <i>Materials and Methods</i> .....                                    | 25        |
| <i>Results and Discussion</i> .....                                   | 27        |
| <i>Summary and Conclusions</i> .....                                  | 30        |
| <i>Literature Cited</i> .....   | 30        |
| <b>Chapter 4. Sediment Characteristics .....</b>                      | <b>35</b> |
| <i>Introduction</i> .....   | 35        |
| <i>Materials and Methods</i> .....                                    | 36        |
| <i>Results and Discussion</i> .....                                   | 37        |
| <i>Summary and Conclusions</i> .....                                  | 43        |
| <i>Literature Cited</i> .....   | 44        |
| <b>Chapter 5. Macrobenthic Communities .....</b>                      | <b>47</b> |
| <i>Introduction</i> .....   | 47        |
| <i>Materials and Methods</i> .....                                    | 47        |
| <i>Results and Discussion</i> .....                                   | 49        |
| <i>Summary and Conclusions</i> .....                                  | 57        |
| <i>Literature Cited</i> .....   | 58        |
| <b>Chapter 6. Demersal Fishes and Megabenthic Invertebrates .....</b> | <b>63</b> |
| <i>Introduction</i> .....   | 63        |
| <i>Materials and Methods</i> .....                                    | 63        |
| <i>Results and Discussion</i> .....                                   | 64        |
| <i>Summary and Conclusions</i> .....                                  | 72        |
| <i>Literature Cited</i> .....   | 72        |

## Table of Contents *(continued)*

---

|   |           |
|---|-----------|
| <b>Chapter 7. Bioaccumulation of Contaminants in Fish Tissues .....</b> | <b>77</b> |
| <i>Introduction</i> .....   | 77        |
| <i>Materials and Methods</i> .....                                      | 77        |
| <i>Results and Discussion</i> .....                                     | 79        |
| <i>Summary and Conclusions</i> .....                                    | 83        |
| <i>Literature Cited</i> .....   | 85        |
| <b>Glossary .....</b>   | <b>87</b> |

### **Appendices**

*Appendix A:* Supporting Data — Oceanographic Conditions

*Appendix B:* Supporting Data — Water Quality

*Appendix C:* Supporting Data — Sediment Characteristics

*Appendix D:* Supporting Data — Macrobenthic Communities

*Appendix E:* Supporting Data — Demersal Fishes and Megabenthic Invertebrates

*Appendix F:* Supporting Data — Bioaccumulation of Contaminants in Fish Tissues

# Credits and Acknowledgements

---

## **Technical Editors**

Tim Stebbins Ami Latker

## **Production Editors**

Eliza Moore Andy Davenport Nick Haring

## **GIS Graphics**

Maiko Kasuya Dawn Olson

## **Executive Summary**

Tim Stebbins Ami Latker

## **Chapter 1. General Introduction**

Tim Stebbins

## **Chapter 2. Oceanographic Conditions**

Dan Ituarte Ami Latker Ross Duggan Robin Gartman

## **Chapter 3. Water Quality**

Andrew Davenport Ami Latker

## **Chapter 4. Sediment Characteristics**

Eliza Moore

## **Chapter 5. Macrobenthic Communities**

Nick Haring Tim Stebbins

## **Chapter 6. Demersal Fishes & Megabenthic Invertebrates**

Robin Gartman Ami Latker

## **Chapter 7. Bioaccumulation of Contaminants in Fish Tissues**

Ami Latker Robin Gartman

# Credits and Acknowledgements

*(continued)*

---

## Cover Photo

View of the ocean and seacliffs from the Point Loma Wastewater Treatment Plant. Photo by Andrew Davenport.

## Acknowledgments

We are grateful to the personnel of the City's Marine Biology and Microbiology Laboratories (see listings below) for their assistance in the collection and processing of all samples and for discussions of the results. The completion of this report would not have been possible without their continued efforts and contributions. We would also like to acknowledge the City's Wastewater Chemistry Services Section for providing the chemistry data analyzed herein.

### Marine Biology and Ocean Operations Section

Tim Stebbins  
Senior Marine Biologist

|                       |                               |                       |
|-----------------------|-------------------------------|-----------------------|
| Katie Beauchamp       | John Byrne                    | Geoff Daly            |
| Andy Davenport        | Tim Douglass                  | Brenda Dowell         |
| Ross Duggan           | Wendy Enright                 | Adriano Feit          |
| Robin Gartman         | Nick Haring                   | Dan Ituarte           |
| Mike Kelly            | Maiko Kasuya                  | Kathy Langan-Cranford |
| Ami Latker            | Megan Lilly                   | Richard Mange         |
| Ricardo Martinez-Lara | Eliza Moore                   | Dawn Olson            |
| Jen Pettis-Schallert  | Veronica Rodriguez-Villanueva | Ron Velarde           |
| Greg Welch            | Lan Wiborg                    |                       |

### Marine Microbiology / Vector Management Section

|                 |                 |               |
|-----------------|-----------------|---------------|
| George Alfonso  | Roxanne Davis   | André Macedo  |
| Laila Othman    | Zaira Rodriguez | Sonji Romero  |
| Aaron Russell   | Rumana Shahzad  | Zakee Shabazz |
| Joseph Toctocan |                 |               |

**How to cite this document:** City of San Diego. (2010). Annual Receiving Waters Monitoring Report for the Point Loma Ocean Outfall, 2009. City of San Diego Ocean Monitoring Program, Public Utilities Department, Environmental Monitoring and Technical Services Division, San Diego, CA.